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Research Article

Variability in body mass index among patients with respiratory disorders in a tertiary care teaching hospital

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Abstract: Recent studies in developing countries have, shown that a transition is occurring, and both under-nutrition and overweight or obesity could co-exist. India is likely to face similar transitions in nutrition-related problems. As both underweight and over- weight increase the risk of several diseases and both may co-exist in communities, knowledge of the magnitude of both the problems becomes an important public-health issue. To observe the variations in BMI among patients with respiratory disorders and to assess the impact of BMI variations on treatment outcome**.** This is an observational cross sectional study of patients attending pulmonary OPD with complaints of respiratory system disorders who had taken the prescribed medicines for more than a week at our hospital or at their local clinics. A total of 150 patients were enrolled and their demographic details, medical diagnosis and other co-morbidities were recorded. The BMI of each patient was calculated from weight and height [Quetelet index]. Patients were also asked to rate the effectiveness of the medicinal treatment prescribed to them for their clinical condition on a scale of 0 to 4 [0=No response; 1=poor response (<25%); 2= somewhat relief (<50%); 3=adequate response (<75%); 4=complete response (upto100%)]. The number of male was more than female (68.75% and 31.25% respectively). The most common respiratory disorder observed was COPD (37.3%) in all the BMI categories of the patient, followed by BA-AR (19.3%), pulmonary TB (16.7%), and others (26.6%) and irrespective of severity of respiratory diseases, greater proportion of normal weight patient was significantly better responsive to prescribed treatment as compared to overweight and underweight patients (P<0.001).The most common respiratory disorder observed was COPD (37.6%) in all the BMI categories of the patient. BMI may also affect treatment response of patient presented with complaints of respiratory system disorder.

Keywords: BMI, Respiratory co-morbidities, COPD, under nutrition, over nutrition

INTRODUCTION

Overweight and obese personal are increasing worldwide [1, 2] and the problem of under-nutrition has been a major public-health concern in developing countries since many decades. Currently published data from developing nations suggest that a transition is occurring, and both under-nutrition and overweight or obesity could co-exist [3-5].

In India with sustained economic development similar transitions in nutrition-related problems is on a rise due to increased availability and consumption of food, changes in life-style and increased urbanization. The problem of under-nutrition has already been well-documented; however recent studies have focused on the problem of overweight and obesity [6, 7]. As both under-nutrition and over-nutrition can increase the risk of several diseases [5, 8] and both underweight and overweight may co-exist in communities, therefore the magnitude of both the conditions becomes an important public-health issue. Although studies on nutritional status have been carried out in India [9-16], the available information were more of a general survey and were confined to urban or rural areas or limited to specific age-groups.

Since respiratory disorders are rising and prevalent in the community, the underlying patho-physiological process might get altered by nutritional status of an individual. Also evidences suggest that the lung volumes i.e. FEV1, FVC etc. varies according to variability in body mass index. Moreover, several

validated markers to classify the severity of COPD have been proposed [17]. BODE index (Body-mass index, Obstruction, Dyspnoea and Exercise capacity index) is used as a staging tool to predict prognosis of COPD patients [18]. Body-mass index (BMI) is a component of BODE index and acts as an independent prognostic factor of functional status.

Studies from India had documented the association of low BMI with longer hospital stay among COPD patients who were hospitalized due to acute exacerbation [19, 20]. However, no study from India had evaluated the variation in BMI among patients with various other respiratory system disorder i.e. AR-BA, Pulmonary TB, URTI etc.

In view of these shortcomings and the emerging scenario of co-existence of underweight and over- weight or obesity, further studies on the nutritional profile and associated co-morbidities of the individuals in a community and their impact on treatment outcome are required. We therefore planned this study to observe the variation in BMI among patients with respiratory system disorders and its impact on treatment outcome.

MATERIAL AND METHODS

It was an observational cross sectional study of patients attending pulmonary OPD with complaints of respiratory system disorders who had taken the prescribed medicines for more than a week at our hospital or at their local clinics. A total of 150 patients were enrolled, prospectively and their demographic details, medical diagnosis and other comorbidities were recorded. The subjects were measured wearing light clothing and no footwear. Weight was measured to the nearest 0.5 kg using a bathroom scale, which was calibrated on a weekly basis with known weights. To ensure consistency and avoid inter-observer variability, a single machine was used, and the same observer took the measurements. Height was measured with the subject standing erect with head in the Frankfurt plane and ankles pressed against a wall on which a measuring tape had been fixed. The study was carried out mostly in the forenoon.

Patients were also asked to rate the effectiveness of the medicinal treatment prescribed to them for their clinical condition on a scale of 0 to 4 [0=No response; 1=poor response (<25%); 2= somewhat relief (<50%); 3=adequate response (<75%); 4=complete response (upto100%)].

DEFINITION OF CATEGORIES

BMI was calculated by dividing the weight of an individual in kg by the square of his/her height measured in meters. The subjects were classified into one of the three categories according to the BMI: (a) underweight—BMI <18.5 kg/m2; (b) normal—BMI 18.5-24.9 kg/m2; (c) overweight—BMI ≥25 kg/m2.

STATISTICAL ANALYSIS

Data was analyzed using the SPSS software (version 20.0). The prevalence of under-weight, normal and over-weight, subjects was obtained. The student t test was applied to compare the difference in treatment response in various BMI categories patient. Multiple logistic regression analysis was done to calculate the adjusted odds ratio. For the purpose of calculating, the adjusted odds for the occurrence of underweight subjects with BMI <18.5 were compared with those with normal BMI (18.5-24.9), while for overweight, subjects with BMI ≥25 were compared with those with normal BMI (18.5-24.9).

RESULTS

In total, 150 subjects were studied. The number of male was more than female (68.75% and 31.25% respectively). Significant differences ($p<0.05$) were observed in the mean BMI in both males and females [Fig. 1]. Overall, only half (48%) of the 150 subjects had a normal nutritional status (BMI>18.5 and <25kg/m^2), while 30% were underweight (BMI<18.5 kg/m^2), 22% overweight (BMI> 25kg/m^2).

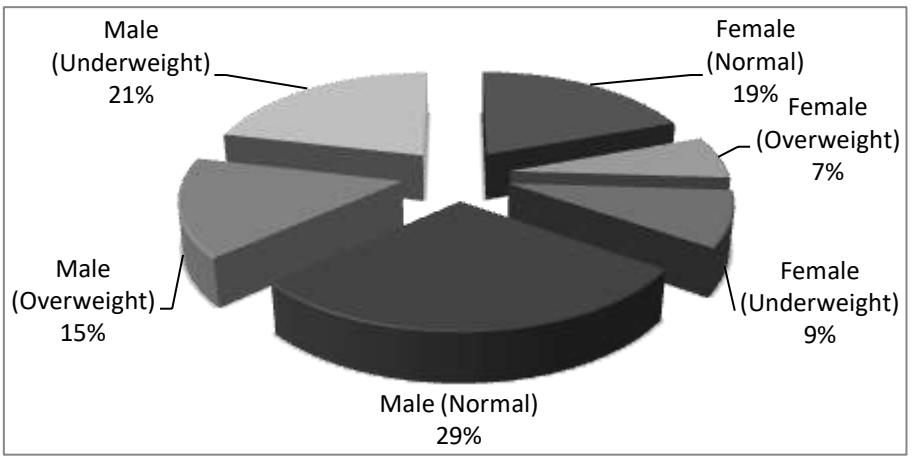

Fig 1: BMI variability in Both sex

Table-1 depicts the proportion of respiratory comorbidities in different age groups. Most of the COPD patients lie in 51-74 years age group (83.9%), followed by 26 -50 years age group (8.9%).

Table-2 and Fig.2 depicts the BMI categories and respiratory comorbidities in both sexes. The most common respiratory disorder observed was COPD (37.3%) in all the BMI categories of the patient, followed by other respiratory system disorders i.e. BA-AR (19.3%), pulmonary TB (16.7%), and others (26.6%).

Table-1: Age wise distribution of respiratory comorbidities

Age groups (years)	Diagnosis						Percentage of age-wise distribution of patients
	AR	BA	COPD	Others	PULM TB	URTI	
15-25	27.3%	22.2%	-	9.4%	16.0%	12.5%	10.0%
26-50	63.6%	61.1%	8.9%	46.9%	52.0%	75.0%	38.0%
51-74	9.1%	16.7%	83.9%	37.5%	32.0%	12.5%	48.0%
>75	-	-	7.1%	6.3%	-	-	4.0%
	Total = 100%						

Table-2: BMI categories and respiratory comorbidities

BMI Category	Diagnosis						Total No (%) of patients in various BMI categories
	AR	BA	COPD	Others	PULM TB	URTI	
Normal	7	11	23	18	10	3	72 (48%)
Overweight	3	6	12	5	4	3	33 (22%)
Underweight	1	1	21	9	11	2	45 (30%)
Total No. (%)	11 (7.33%)	18 (12%)	56 (37.3%)	32 (21.3%)	25 (16.7%)	8 (5.3%)	Total = 150 (100%)

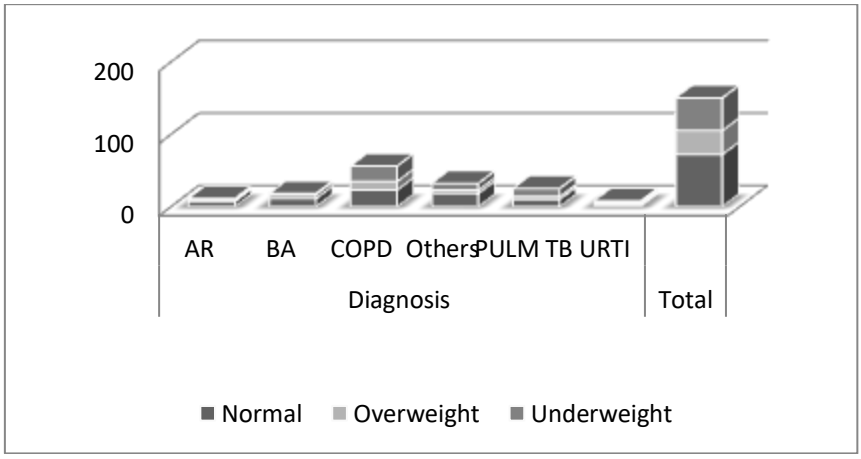

Fig 2: BMI Category and Diagnosis

Table-3 shows the proportion of underweight, normal, and overweight and response to prescribed medicinal treatment. It was seen that irrespective of severity of respiratory diseases, greater proportion of normal weight patient was significantly better responsive to prescribed treatment as compared to overweight and underweight patients ($P<0.001$). The chi-square test revealed these proportions to be significantly different.

Table 3: BMI Category and treatment response

BMI Category	Treatment response				Total
	Poor response	Somewhat relief	Adequate response	Complete response	
Normal	17	20	33	2	72
Overweight	13	15	4	1	33
Underweight	12	23	10	0	45
Total Count					150

DISCUSSION

The published data on the prevalence of obesity has shown that about 15% of men and 22% of women were obese in European countries [21] and the prevalence of obesity was 10-20% in men and 10-25% in women in US population [22]. Further the rising magnitude of obesity observed over the years even in developing countries like India is a cause for concern.

As shown in the present study, the problem of overweight/obesity is significant and co-exists with a high prevalence of underweight subjects, 22% and 30% respectively. This finding is supported by the data from other developing countries showing the co-existence of both the nutritional problems [23].

A retrospective observational study had demonstrated that middle-aged and older men with low body weight were at higher risk of developing COPD even after adjusting for smoking history, age and FEV1% predicted [24]. Another study suggested that low BMI was a poor prognostic marker in stable COPD patients [19]. However, BMI have little impact on severity of exacerbation and short-term clinical outcomes of the COPD patients [25].

Studies on western COPD populations have reported lower prevalence of underweight [19, 26, 27]. However, in our study, we observed that the most common respiratory disorder was COPD (37.6%) and underweight population comprised of 30% which was quite higher than observed in studies of western countries but similar to a study which [28] observed 27% of moderate to severe COPD patients as underweight (BMI < 21 kg/m2).

India appears to be in a stage of nutritional transition, especially in urban areas which may poses a major challenge for the future [29]. Therefore, efforts at the national level are needed to address the problem of over-nutrition and under-nutrition.

In this study, it was seen that irrespective of severity of respiratory diseases, greater proportion of normal weight patient was significantly better responsive to prescribed treatment as compared to overweight and underweight patients.

CONCLUSION

We concluded that the most common respiratory disorder observed was COPD (37.6%) in all the BMI categories of the patient. BMI may also affect treatment response of patient presented with complaints of respiratory system disorder. Nutritional assessment and management is an important therapeutic option in patients with chronic respiratory diseases. However studies with large sample size are needed to be carried out to reconfirm the finding in a large population.

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